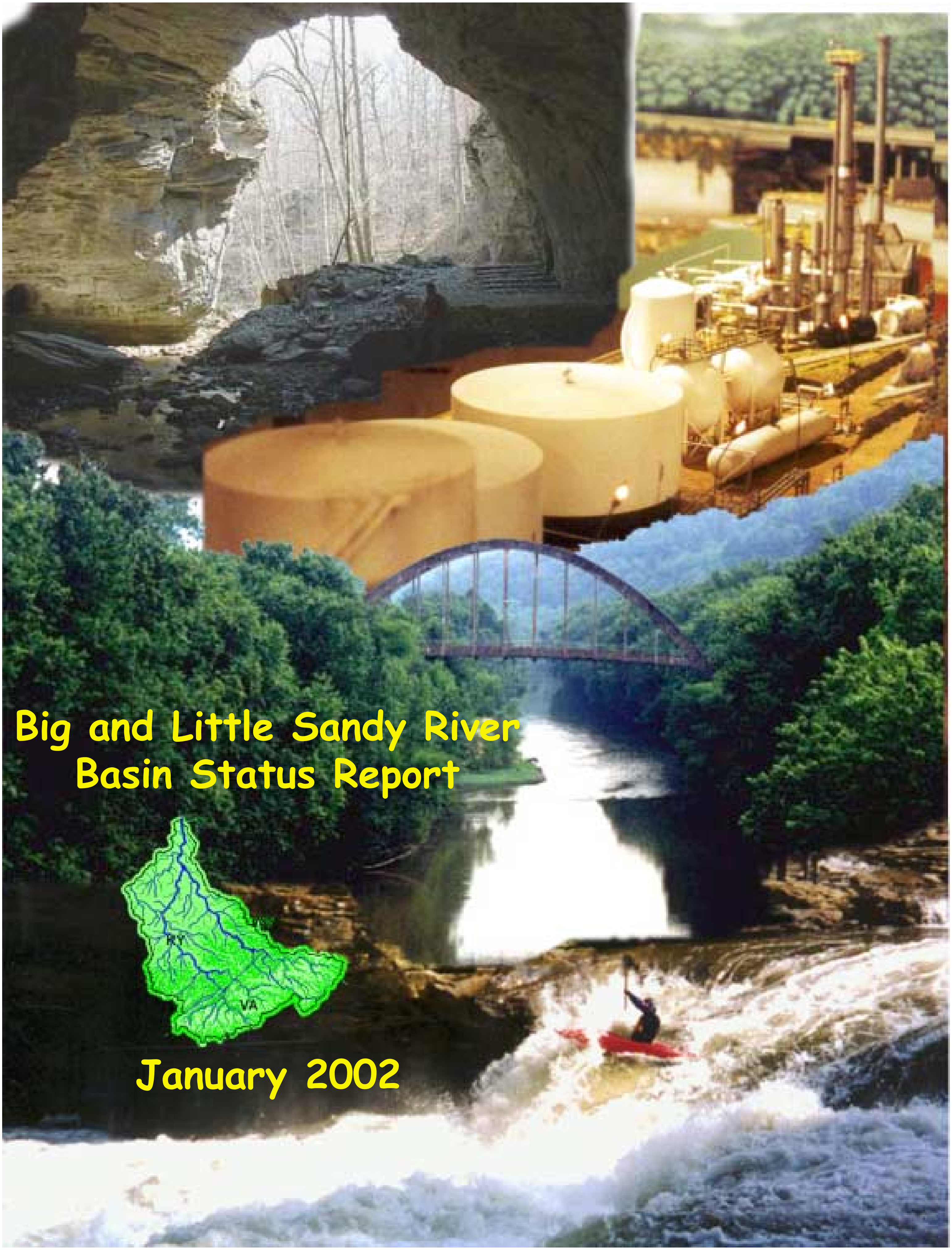
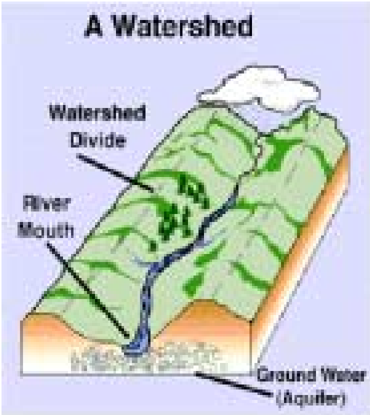


Big and Little Sandy River Basin Status Report

January 2002



Basin or Watershed?
The *basin* of a river or stream is all the land that is drained by a lake, river or stream. Another word for basin is *watershed*, which comes from the observation that in a healthy watershed, water is stored, as in a shed, in an area of land and is slowly released to flow downhill into a body of water.

Geography and Watershed Health
How does geography affect the health of streams and watersheds? The lay of the land, soil types, and vegetation in an area can directly affect water quality – especially when the land is cleared or tilled. For example, basins with loose soils, steep hills, or little vegetation are often severely eroded by rainstorms, leaving streams and rivers muddy and subject to flooding from rapid runoff; little water is stored in the watershed. Vegetation can reduce flooding by slowing down runoff from rainstorms and can even filter out silt and other contaminants before they reach streams. Trees, bushes, and tall grass along stream banks also reduce erosion along the channel and create valuable habitat for birds, mammals, and other creatures. The vegetation also increases absorption into the ground to provide greater storage capacity for water supplies.

What is a watershed?

No matter where you live, work, or play, you are in a watershed. A watershed is a geographic area where all water running off the land drains to a specific location. This location may be a stream, river, lake, wetland, or ocean; or the water may drain underground into the groundwater. You may live on a creek, which is considered a small watershed. Your creek may join a river, which is a larger watershed. The river may have many smaller creeks, known as tributaries, that drain into it, and each of these tributaries has a small watershed associated with it, and each is part of the larger watershed of the river.

Is the watershed healthy?

That is the main question this report explores. In order to determine if the region's streams are contaminated, we have reviewed water sampling data, assessments of stream and river bank conditions, discharge permits for wastewater treatment plants, and land-use activities like farming, development, logging, and mining. What happens in the river basin – or *watershed* – directly impacts water quality, water quantity, and habitat conditions. Some tributaries in the Big and Little Sandy River Basins are contaminated by habitat modification (107 miles of streams), resource extraction (462 miles), waste disposal on the land (261 miles), sewage (283 miles), and many unknown sources (399 miles). These sources of pollutants contribute bacteria from human sewage or livestock; silt from erosion, construction, or logging; algae blooms fed by nutrients from fertilizers or manure; and various pollutants from mining and industrial or urban wastewater plants. That is what this report is all about.

Maintaining good water quality in unpolluted areas of the watershed and improving contamination in other sections will require careful evaluation to determine what is affecting watershed health. This evaluation will show what needs to be done to improve conditions in the watershed.

Why Should I Care?

If we all live in a watershed, then why should you care about watershed management? Watershed management is all about protecting and restoring what is good and useful to the people who live in the watershed and protecting the people and their quality of life, too. Past laws were used to address specific, single-media issues. However, watershed management takes a broader approach and takes into account the interrelatedness of different media and issues. An unhealthy watershed can affect the people living there and biodiversity by:

- Exposure to contaminated water(s) when wading, swimming, or other recreational use; potential consumption of contaminated water(s) during recreational use or contamination of water supplies. Examples of contamination include bacteria (fecal), metals, organics, nutrients, sediment, pH, etc.

- Loss of habitat due to contamination of water or alteration of the physical structure, which alters the flow of water across the land.

- Exposure to flooding from changes in the flow of water in the watershed; risks increase with construction in flood plains, deforestation, or poor management of the watershed, such as poorly planned development.

■ Increases in impervious cover which can result in increased flooding, erosion, loss of habitat, and decreased water quality (only a 10% change in impervious cover in a watershed can make measurable changes in biota and eriosion downstream).

■Loss of surface and groundwater supplies for public drinking water; the droughts of the last two years have been greatly increased by rapid runoff of water, lack of storage in the watershed, and decreased recharging of the ground water aquifers.

Kentucky is a water-rich state. But plenty of water does not necessarily mean having abundant *usable* water. As with all natural resources we must use water wisely. We need clean water for drinking, food production, jobs, transportation, recreation, beauty, and habitat for some of the most unique plants and animals in the world.

Preventing water pollution is difficult, however, because water is dynamic – it flows freely from property to property, from locality to locality, even between the surface and underground. How water is used upstream can and does affect its quality downstream. Since we all live in a watershed, this affects us all.

Because of the complexites of watersheds, management of water resources, like most natural systems, should be done holistically. What one does about water quality, and how one goes about it, is determined largely by one's objectives. The essence of water management problems is simple: man's land-based activities, from which benefits are derived, generate waste and have negative effects upon water resources. Since society values our natural resources, for economic and quality of life reasons, we have passed laws to protect these resources.

At any one point in time, a water management framework is an aggregation of discrete and interrelated activities being carried out by persons and institutions that have widely different responsibility boundaries. The key stakeholders within the framework are Natural Resources and Environmental Protection Cabinet, area development districts, Natural Resources Conservation Service, U.S. Forest Service, local government, citizen groups and private business enterprises. Each of the stakeholders has had and can be expected to have different objectives, concerns, and commitments relative to the management of water quality.

How do we determine watershed health?

Healthy watersheds produce clean water – water that is fishable, swimmable and suitable as a drinking water source. Watersheds that meet these criteria support a wide variety of aquatic life and are a valuable resource. State agencies mostly follow the guidelines in the federal Clean Water Act to determine whether or not the quality of river and stream water is acceptable. Under the Clean Water Act, states set standards for the water based on how it is being used. These uses can consider the high-quality values of a wild and scenic river, a stream's importance as a drinking water source, wildlife habitat, or other uses. The standards include benchmarks for various *parameters* like dissolved oxygen, temperature, acidity, and other measurable qualities.

If a lake, river, or stream meets the standards for fishing, swimming, and drinking water sources, it is said to *fully support* its designated uses (see centerfold map and tables). If it falls short on a few measures, it may only *partially support* its uses. Failure on additional counts can mean that it is *not supporting* its designated uses. The condition of these waters is reported to

Nonpoint Source Pollution- The number one cause of the degradation of Kentucky's waterways is nonpoint source pollution(NPS). It is called nonpoint source pollution because it does not come from a single source, or *point*, such as a sewage treatment plant or an industrial discharge pipe. NPS pollution effects seldom show up overnight—they often go unnoticed for years. This characteristic makes it all the more difficult to control.

NPS pollution occurs mainly through storm water runoff. When it rains, runoff from farmland, city streets, construction sites, abandoned mined lands, logging, and suburban lawns, roofs, and driveways enters our waterways. This runoff often contains harmful substances such as toxins, excess nutrients, and sediments. The greatest impacts in the basin occur from resource extraction (mining, logging) and residential sewage (straight pipes).

There are four major forms of NPS pollution: sediments, nutrients, toxic substances, and pathogens.

•*Sediments* are soil particles carried by rainwater into streams, lakes, and rivers. By volume, sediment is the greatest pollutant of all. It is caused mainly by erosion resulting from bare land, poor farming practices, construction, and development.

•*Nutrients* are substances which help plants and animals live and grow. There are two nutrients that are of the most concern when they become excessive; nitrogen and phosphorus. Fertilizer on lawns and farmlands and animal waste are the main sources of these substances.

•*Toxic Substances* are chemicals which cause human and wildlife health problems. They include organic and inorganic chemicals and metals, pesticides, formaldehyde, household chemicals, gasoline, motor oil, battery acid, roadway salt, and so on.

•*Pathogens* are disease-causing microorganisms present in human and animal waste. Most pathogens are bacteria.

Congress, as required by the Clean Water Act, Section 305(b). Bodies of water that do not support their designated uses must have cleanup plans that identify and quantify the problem pollutants and specify how they will be reduced. Sometimes the pollutants come from wastewater treatment plants, other times they are carried into the water by runoff from towns, farms, new developments, or other areas.

Watershed health means more than good water chemistry. In addition to chemical analyses, watershed health can be measured by observing plant and animal life. For example, certain species are *indicators*. Also, habitat is important to watershed and stream health. Vegetation in the riparian area - especially shrubs and trees - provides food and cover for terrestrial and aquatic life. Riparian vegetation also holds stream banks in place and helps to filter soil erosion and other polluted runoff. The amount and type of vegetation along a stream, lake, or sinkhole determines riparian health.

Trout Perch indicator of high quality water

Watershed health also means having good storage and retention capabilities in the basin. That is, under ideal conditions, as rain falls upon the earth, water either evaporates, soaks into the ground, or runs off into streams, lakes, and rivers. For water to soak into the ground, the water must encounter some obstacles that slow its flow down hill, such as retention basins, trees, leaf litter in a forest, even grass. All these things cause water flow to slow down enough for it to soak into the ground. A hard-packed clay field or a parking lot will simply shed the water, forcing it to run downstream. Conversely, if the water can soak into the ground, it recharges the groundwater for wells and will slowly release it to our streams and lakes. This run-off/soak-in cycle has two effects: In times of high flow, it can cause all the water to run off so rapidly that it results in flooding. Or, in times of low flow, it can result in streams that run completely dry because there is no runoff or spring seepage to keep the rivers flowing.

During times of low stream flow, which occur more often in the late summer and early fall, streams may have less suspended silt but may be rich and green from algae growth. During times of low flow, most of the water in streams comes from groundwater inflow.

While state officials have information from samples collected on the Big and Little Sandy Rivers, much of the water in the basin has not been tested. An interagency workgroup is coordinating efforts to increase the amount of monitoring conducted in the region. By working together, tax dollars can be stretched and better information provided on the condition of the watershed. Also, citizens active in the Big and Little Sandy River Watershed Watch have collected data to raise public awareness. Reducing concentrations of pollutants that exceed state standards will require a considerable amount of cooperative action and analysis.

***Organisms** as indicators*

Healthy streams have low levels of contaminants and contain a diversity of plants and animals. Certain mussels and insect larvae (caddisfly, stonefly, mayfly) are often used as indicators of good water quality, similar to the coal mine canaries used to detect poisonous gases. Since these mussels and larva can live only in relatively clean water, their presence usually indicates that problems are few in that section of the stream.

Water quality indicator: Aquatic insects

Kentucky Water Quality Standards

The following parameters, or measurable criteria, are only a few of those used to define Kentucky's water quality standards. The criteria are listed below. For example, if a water sample shows more than 200 fecal coliform CFUs in a 100 milliliter sample, the water would be considered contaminated.

- Dissolved Oxygen: >4.0 Milligrams per liter
- pH (measures acidity): 6-9 Standard units (7.0-neutral)
- Fecal coliform: 200 Colony-Forming Units per 100 milliliters of water
- Temperature: 89 Deg.

Important Sections of the Clean Water Act

Clean Water Act

§208 – Areawide Waste Treatment Management

§303 – Water Quality Standards and Implementation Plan

§305 – Water Quality Inventory

§319 – Nonpoint Source Management Programs

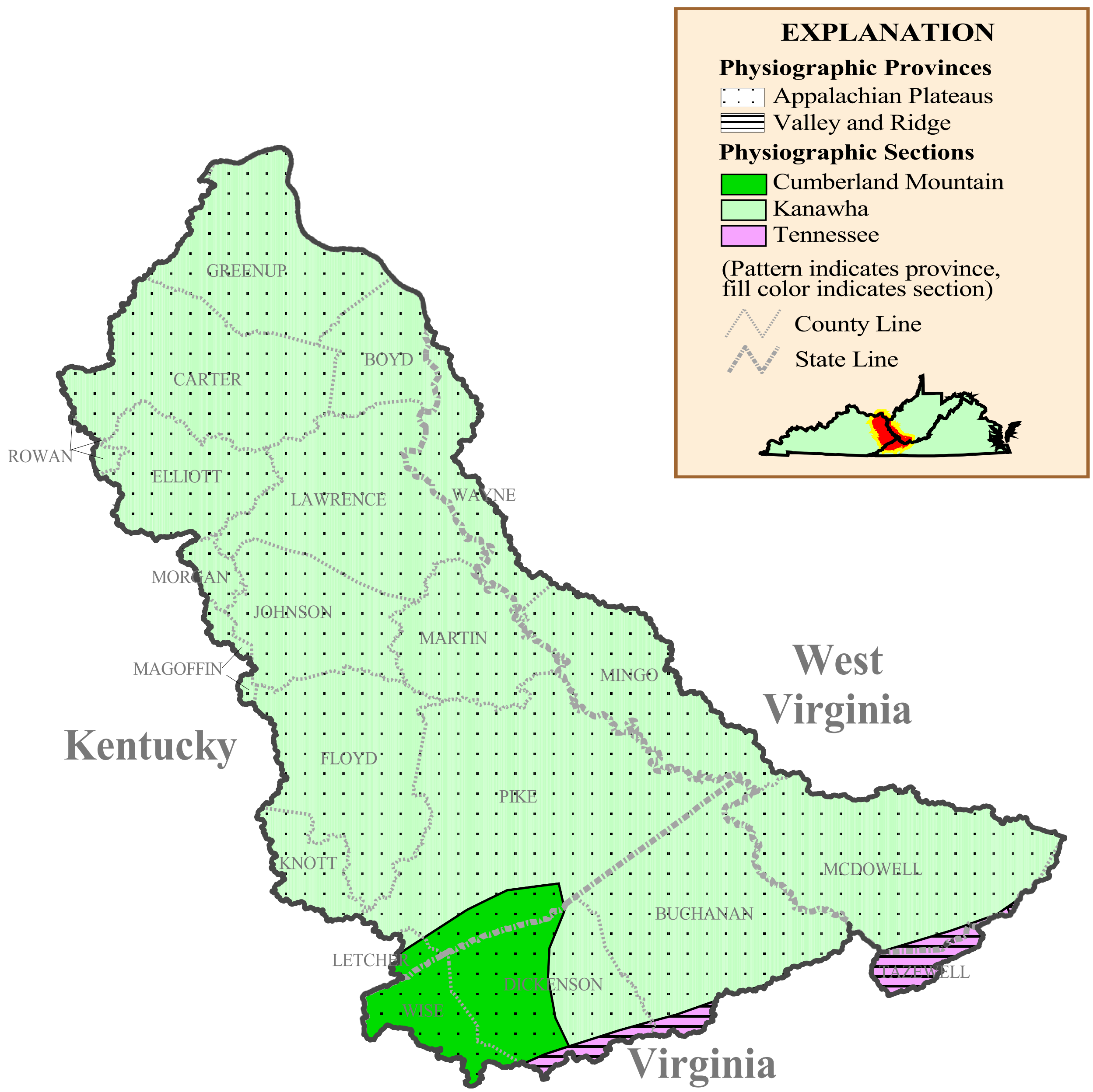
§401 & §404 - Water Quality Certification and Permits for Dredged and Fill Materials

§402 – National Pollutant Discharge Elimination System

Physiography

The Big Sandy River flows along the eastern border of the Commonwealth of Kentucky and West Virginia. The Big Sandy River basin extends as far west in Kentucky as Morgan County and as far east in West Virginia as McDowell County and as far south in Virginia as Wise County. The river flows north and empties into the Ohio River. The basin encompasses an area about 2,300 square miles, which represents slightly more than 5 percent of the Commonwealth of Kentucky.

The physiographic region is the Eastern Coalfield. The topography is generally steep, rugged mountains that have long sharp ridges and are separated by deep coves and narrow valleys forming a many-branched pattern of streams that drain the basin. Bedrock is mostly sandstone, siltstone, shale, coal, and limestone of the Pennsylvanian, Mississippian, and Devonian systems. The most extensive geology is of the Brethit and Lee formations. Elevation ranges from 500 to 3,200 feet above sea level.



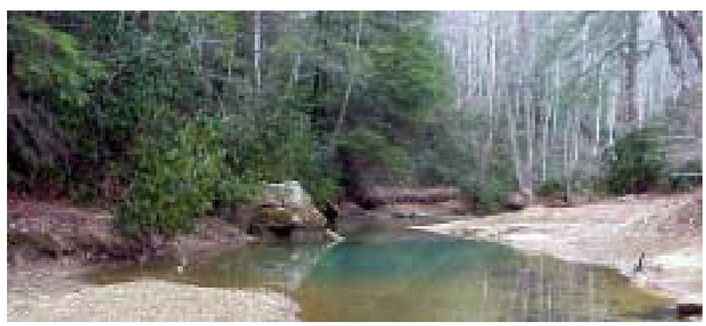
Forest Relationship to Water Quality

The Big Sandy River Basin is almost totally forested . It represents one of the most biodiverse watersheds in North America. Tree species include hemlock, Virginia pine, red oak, several other oak species, tulip poplar, several hickory species, white ash, beech, maples, black walnut, basswood, buckeye, cherry, red cedar, and many others. This forest has an important role in water quality. Not only does it prevent rapid runoff and runoff of sediments from reaching streams, forested watersheds keep stream temperatures cooler and prevent excess nutrients from impacting stream health. Consequently, a damaged forest can directly and adversely impact water quality. In Kentucky, timber production is at an historic high of more than one billion board feet a year. There is concern that the basin's biodiversity and water quality are being negatively impacted by poor logging pratices.

Recognizing the increasing demands on our forest, the Kentucky Legislature passed the Forest Conservation Act of 1998 mandating Best Management Practices (BMP) for logging operations and a Forest Inventory Survey. Strong enforcement of this law can help mitigate the impact of this industry on the basin, but serious questions arise about the sustainability of the harvest of timber at the present levels and the impact it will have upon the water quality in the Big and Little Sandy River basins. Only 16 percent of Kentucky's owners of forest land have a forest management plan in place.

What is an Exceptional Water?

Exceptional waters are defined as:
Surface water that is designated as a Kentucky Wild River.
or
A waterbody in the Cabinet's reference reach network, an outstanding state resource water that does not support federally threatened or endangered aquatic species.
or
Surface water that supports all applicable designated uses. A fish community that is rated "excellent" by the Index of Biotic Integrity.
or
A macroinvertebrate community that is rated "excellent" by the Macroinvertebrate Bioassessment Index.



Exceptional Waters

The Little Sandy River Basin contains four exceptional waters. Laurel Creek, Big Sinking Creek, Arabs Fork and Big Caney Creek, two in Elliott County, are rare cold water habitats. These two cold water habitats are very special places that have the highest water quality and support many life forms found only in this type of pristine environment. The cool temperatures and high levels of dissolved oxygen are due to the high cliff walls and heavily forested stream banks. Within the 14.5 miles of Laurel Creek and the 12.8 miles of Big Caney Creek are 29 species of fish, including the Trout-perch (of special concern in Kentucky) and the Kentucky endangered Northern Brook Lamprey. Other species include Central stoneroller, Rosyside dace, Silverjaw minnow, Longear sunfish, Rainbow darter, Fantail darter, Rainbow trout, and Brown trout. The Kentucky Heritage Land Conservation Fund has purchased a portion of the Laurel Creek watershed in an effort to protect this rare habitat.

Coal Mining and Watersheds

Coal is a fossil fuel created by the decomposition of vegetation in a moist environment under extreme conditions of heat and pressure over millions of years. This is an abundant and reliable energy resource used to generate more than 95 percent of the electricity in Kentucky.

Coal extraction in Eastern Kentucky occurs by two methods: surface mining and underground mining.

Surface Mining

Surface mining is used when coal is found close to the surface or on hillsides. This method involves uncovering the coal by the removal of soil and rock. Heavy equipment is used in order to scoop out the coal and replace the empty remains with excavated soil and rock.

Underground mining is used to extract coal lying deep beneath the surface or in seams exposed on hillsides. This method involves breaking or cutting of coal from an underground seam with equipment or explosives. In the room and pillar form of mining, a foundation of pillars and roof bolts support the mining shafts when the coal is removed. In long-wall mining, the roof is supported by hydraulics until the coal is removed and then is allowed to collapse. The coal is then brought to the surface by large moving belts.

Underground Mining

Big Sandy River Basin's largest county, Pike, produced 34 million tons of coal in 2000. The mining industries employ the largest percentages of the labor force for the Big Sandy River Basin. Mining employs about 17 percent of the civilian labor force in the portions of Kentucky, West Virginia, and Virginia that are within the watershed boundary. The map on the following page shows the extent of coal through Appalachia. The circle represents the region of the Big Sandy and Little Sandy River watersheds.

COAL MINING IN OUR WATERSHEDS

2000 COAL REPORTS BIG & LITTLE SANDY WATERSHEDS

COAL PRODUCTION SHORT TONS (THOUSANDS)

- 20,001 TO 34,100
- 12,001 TO 20,000
- 6,101 TO 12,000
- 2,501 TO 6,100
- 401 TO 2,500
- 101 TO 400
- 50 TO 100
- 0 TO 49

KENTUCKY COUNTIES

	# MINES	SHORT TONS (THOUSANDS)
BOYD	0	0
CARTER	0	0
ELLIOTT	0	0
FLOYD	26	2678
GREENUP	0	0
JOHNSON	4	491
KNOTT	48	12633
LAWRENCE	3	120
MAGOFFIN	0	0
MARTIN	23	11138
MORGAN	3	55
PIKE	101	34009

WEST VIRGINIA COUNTIES

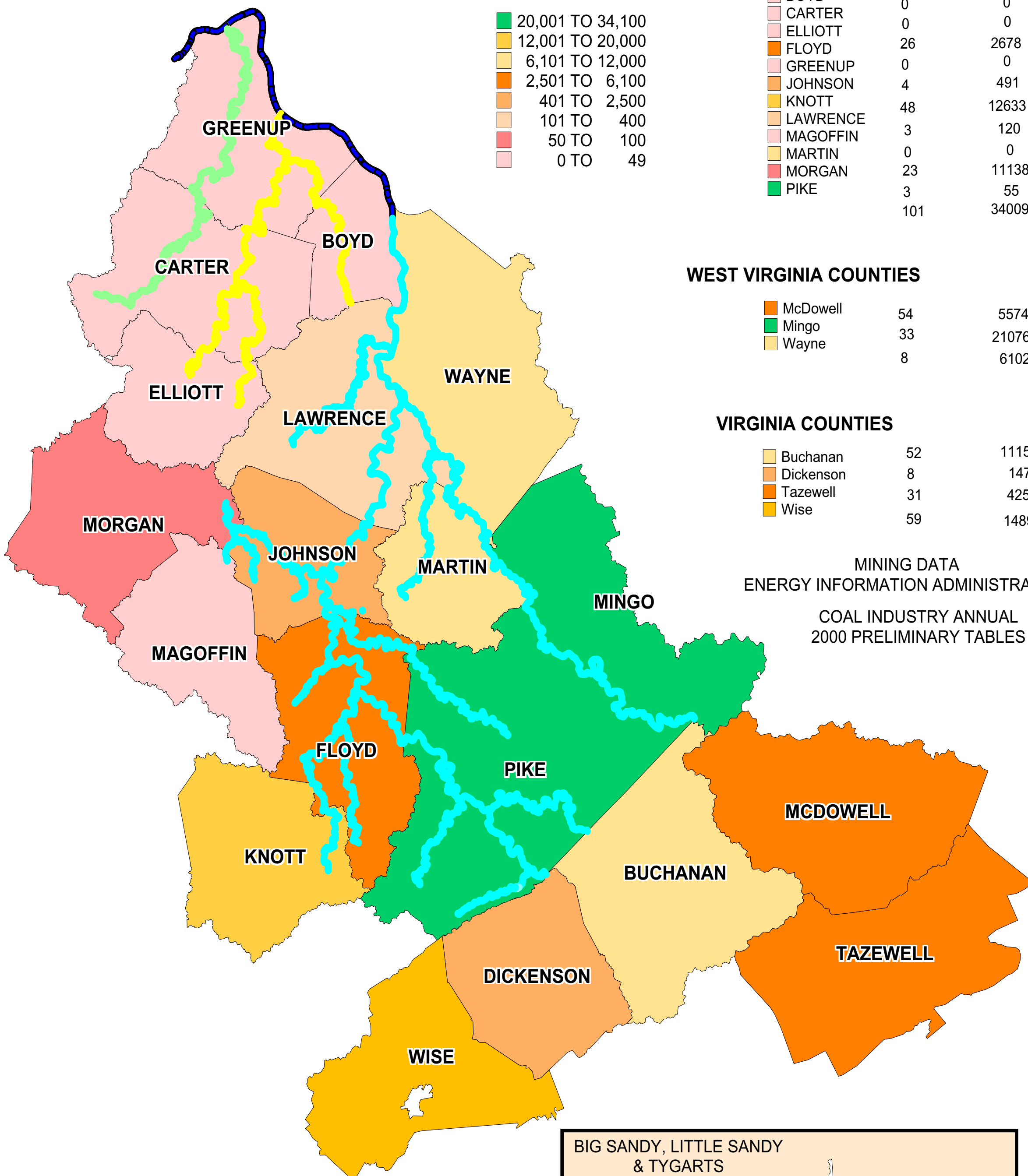
	# MINES	SHORT TONS (THOUSANDS)
McDowell	54	5574
Mingo	33	21076
Wayne	8	6102

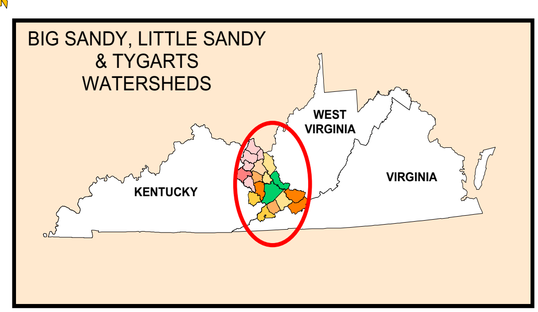
VIRGINIA COUNTIES

	# MINES	SHORT TONS (THOUSANDS)
Buchanan	52	11155
Dickenson	8	1470
Tazewell	31	4259
Wise	59	14892

MINING DATA
ENERGY INFORMATION ADMINISTRATION

COAL INDUSTRY ANNUAL
2000 PRELIMINARY TABLES



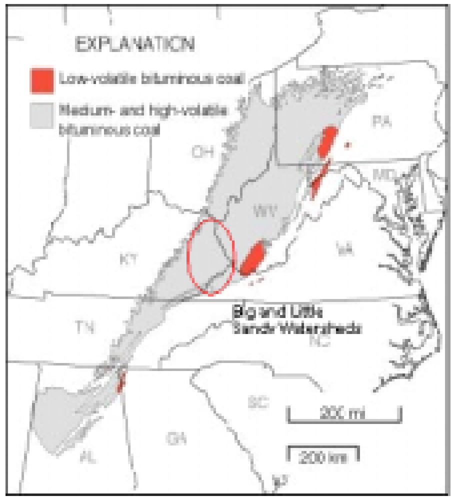


Coal mining activities in the Big Sandy and Little Sandy watersheds increase stream sediment deposition due to the following:

1. Exposure of soils to weathering, compaction, erosion, and chemical alteration of elements.
2. Complete removal of original flora and fauna.
3. Dramatic alteration of surface and groundwater systems, such as fractured bedrock.
4. Creation of acidic or alkaline drainage

The eroded silt and topsoil, carried by surface water runoff, decreases the quality of the streams by creating high levels of silt, smothering aquatic life with sediments and increasing the cost of processing drinking water.

Impacts of coal mining on the watershed can be broken down into three categories: stream deposition, stream pollution, and physical alteration.

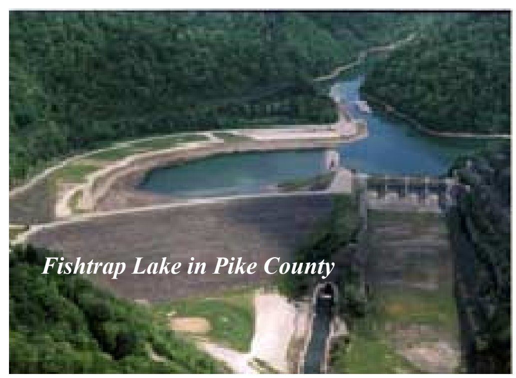


Stream Deposition is a process of laying down sediment and soil into a stream bed, usually caused by soil erosion due to prolonged weather conditions such as rain and wind.

These environmental changes increase the amount of runoff that occurs. Runoff occurs when rain or irrigation water flowing over hard surfaces, or loose soil, picks up pollutants and deposits them into the nearest lake, creek, estuary, or groundwater supply. Coal mining within the Big Sandy and Little Sandy drainage basins removes vegetation and disturbs the soil, which increases soil erosion during heavy rains.

The silt that accumulates in lakes because of runoff causes the lakes to become shallower. This is true of many of the lakes and streams of the Big Sandy and Little Sandy watersheds. Examples of increased silt and sediment deposition occur in Dewey Lake located in Floyd County (to the left) and Fishtrap Lake located in Pike County (below).

Dewey Lake in Floyd County



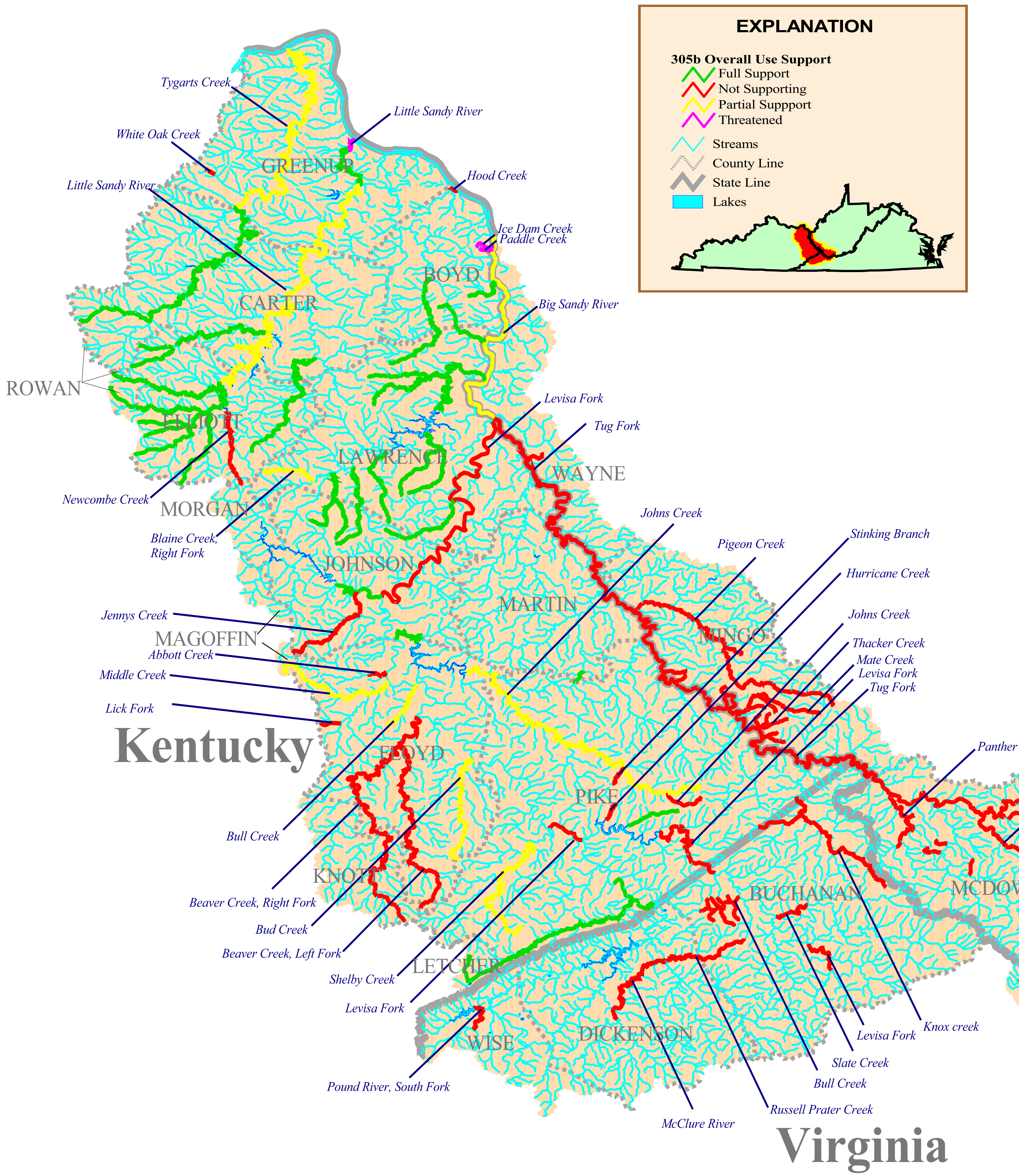
Fishtrap Lake in Pike County

Increased runoff associated with mining creates favorable conditions for flooding. Floods occur when soil and vegetation cannot absorb all the water. Flooding affects streams by eroding soils as well as sediment deposition problems downstream which alters the natural habitats of fish and other wildlife. Flooding also costs dollars and lives. Increased volume and intensity of runoff causes rapid erosion of stream banks.

Flooding of the Big Sandy River

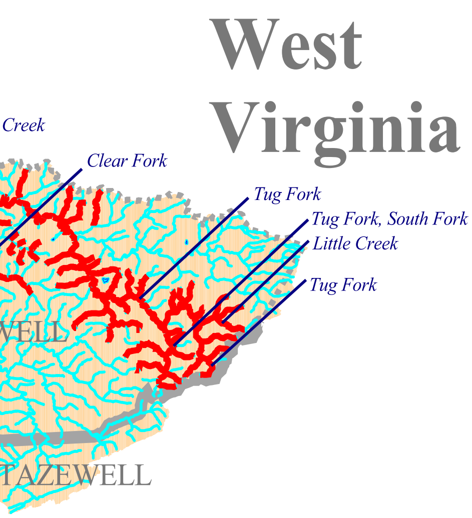
Stream pollution is the contamination of streams by substances harmful to living things. The two most frequent types of mine pollution delivered into streams are acid mine drainage and abandoned mine land sediment.

STREAMS OF SPECIAL CONCERN



Big and Little Sandy Impaired Stream Data

Stream Name	Source of Pollutant	Pollutants
Big Sandy River	Resource Extraction, Dredging, Urban Runoff, Sewage	Metals, Siltation, Turbidity, Pathogens
Harris Branch	Resource Extraction	Sulfates
Horse Creek	Sewage	Pathogens, Nutrients, Low DO
Horsepen Creek	Resource Extraction	Siltation
Ice Dam Creek	Sewage, Land Disposal	Pathogens
Knox Creek (KY)	Sewage, Land Disposal, Unknown	Pathogens, Siltation
Knox Lower (VA)	Resource Extraction, Land Disposal, Sewage, Habitat Modification, Unknown	Metals, Pathogens, Siltation, PCB's
Knox Upper (VA)	Resource Extraction	Siltation
Laurel Lake	Resource Extraction	Siltation
Long Fork	Resource Extraction	pH
Mitchell Branch	Resource Extraction, Habitat Modification	Siltation
Paddle Creek	Sewage, Land Disposal	Pathogens
Pawpaw Creek	Resource Extraction	Siltation
Peter Creek	Sewage, Land Disposal, Resource Extraction	Pathogens, Siltation
Right Fork Blaine Creek	Petroleum Activities	Salinity, Chlorides, Conductivity
Rock Narrows Branch	Sewage	Pathogens
Sugarcamp Branch	Resource Extraction	Metals, Sulfates
Tug Fork	Sewage, Land Disposal, Resource Extraction, Abandoned Mines	Pathogens, Nutrients, DO, Metals, Siltation, Ammonia (unionized)
Wolf Creek	Resource Extraction	Siltation



Stream Name	Source of Pollutants	Pollutants
Adkin Branch	Resource Extraction, Habitat Alteration	Siltation, No Flow
Belcher Branch	Unknown, Resource Extraction, Sewage, Habitat Modification	Oil and Grease, Sulfates, Siltation, Pathogens, No Flow
Buffalo Creek	Unknown	Habitat Alteration Non Flow, Pathogens
Buffalo Creek	Unknown	Habitat Alteration Non Flow, Pathogens
Bull Creek	Unknown, Sewage	Siltation, Pathogens
Dick Williamson Branch	Resource Extraction, Unknown	Siltation, Sulfates, Pathogens
Dick Williamson Branch	Resource Extraction, Unknown	Siltation, Sulfates, Pathogens
Drag Creek	Sewage	Pathogens
Dry Branch/Tug Fork	Sewage	Pathogens
Elk Creek	Unknown	Pathogens
Elk Creek	Unknown	Pathogens
Grapevine Branch	Resource Extraction	Sulfates
Harmon Branch	Resource Extraction	Sulfates
Indian Grave Branch	Sewage	Pathogens
Jennie Creek	Unknown, Spills Accidental	Siltation, Pathogens, Caustic Chemicals
Jennie Creek	Unknown, Spills Accidental	Siltation, Pathogens, Caustic Chemicals
Left Fork Sandlick Creek	Habitat Alteration	No Flow
Lick Creek	Unknown	Unknown, Pathogens
Lick Creek	Unknown	Unknown, Pathogens
Little Creek	Sewage	Pathogens
Marrowbone Creek	Resource Extraction, Unknown	Siltation, Pathogens
Marrowbone Creek	Resource Extraction, Unknown	Siltation, Pathogens
Miller Creek	Unknown,	Metals, Siltation
Miller Creek	Unknown,	Metals, Siltation
Millseat Branch	Sewage	Pathogens
Millstone Branch/Pigeon Creek	Unknown	Pathogens
Millstone Branch/Pigeon Creek	Unknown	Pathogens
Mudlick Fork	Spills Accidental	Caustic Chemicals
Mudlick Fork	Spills Accidental	Caustic Chemicals
Pigeon Creek	Resource Extraction, Collection System Failure, Agriculture	Metals, Siltation, Pathogens
Pigeon Creek	Resource Extraction, Collection System Failure, Agriculture	Metals, Siltation, Pathogens
Pigeonroost Creek/Pigeon Creek	Unknown	Pathogens
Pigeonroost Creek/Pigeon Creek	Unknown	Pathogens
Puncheoncamp Branch/Little Creek	Sewage	Pathogens
Right Fork Sandlick Creek	Habitat Alteration	No Flow
Right Fork/Bull Creek	Unknown, Sewage	Siltation, Pathogens
Road Fork/South Fork	Sewage, Unknown	Pathogens, Siltation
Sandlick Creek	Habitat Alteration, Resource Extraction	Sulfates, No Flow
Silver Creek	Construction, Sewage	Siltation, Pathogens
Silver Creek	Construction, Sewage	Siltation, Pathogens
Simmons Fork/ Trace Fork	Unknown	Pathogens
Simmons Fork/	Unknown	Pathogens

Stream Name	Source of Pollutants	Pollutants
Sprouse Creek	Resource Extraction Hydromodification	Metals, sulfates, siltation,
Powdermill Branch	Resource Extraction, Unknown	Metals, Siltation, Pathogens
Rutherford Branch	Resource Extraction	Metals, Sulfates, pH
Mitchell Branch/ Mate creek	Resource Extraction, Unknown	Sulfates, Pathogens
Chafin Branch	Resource Extraction	Sulfates
Double Camp Fork	Unknown	Siltation, Pathogens
Mate Creek	Hydromodification, Unknown	Sulfates, Siltation, Pathogens
Sulphur Creek	Unknown	Siltation
Scissorsville Branch	Resource Extraction	Metals, Zinc, Sulfates
Mauchlinville Branch	Resource Extraction	Metals, Sulfates, pH
Thacker Creek	Resource Extraction, Unknown	Metals, Zinc, Sulfates, pH, Pathogens
Lick Fork/ Grapevine Creek	Resource Extraction	Metals, Zinc, Sulfates, pH
Grapevine Creek	Hydromodification, Silviculture, Unknown	Metals, Sulfates, Pathogens
Left Fork/ Bull Creek	Unknown	Siltation
Bull Creek	Hydromodification, Unknown	Siltation, Pathogens
Greenbrier Fork	Unknown	Metals, Pathogens
Cub Branch/ Panther Creek	Unknown	Pathogens
Panther Creek	Resource Extraction	Siltation
Horse Creek	Unknown	Pathogens
Mile Branch	Unknown	Pathogens
Grapevine Branch/ Dry Fork	Silviculture, Hydromodification, Unknown	Siltation, Taste & Odor, Pathogens
Beartown Branch	Unknown	Unknown
Groundhog Branch	Unknown	Pathogens
Wolfpen Branch/ Bradshaw Creek	Land disposal, Sewage	Pathogens
Bradshaw Creek	Unknown	Metals
Little Slate Creek	Resource Extraction, Hydromodification, Unknown	Metals, Siltation, Odor
Atwell Branch	Resource Extraction, Unknown	Metals, Pathogens
Bartley Creek	Resource Extraction, Unknown	Suspended solids, Discoloration, Pathogens
Clear Fork Branch	Unknown	Pathogens
Dry Fork/ Tug Fork/ Big Sandy River	Unknown	Pathogens
Lick Branch/Tug Fork	Land disposal , Sewage	Pathogens
Harmon Branch	Unknown	Pathogens
Clear Fork/ Tug Fork	Unknown	Pathogens
Shabbyroom Branch	Hydromodification	Siltation, Pathogens
Coontree Branch/ Spice Creek	Intensive animal feeding operations	Pathogens
Stonecold Branch/Spice Creek	Resource Extraction, Unknown	Sulfates, Pathogens
Badway Branch	Habitat Modification, Unknown	Unknown, Pathogens
Newson Branch	Unknown	Pathogens
Moorecamp Branch	Unknown	Sulfates
Left Fork / Davy Branch	Land Disposal, Sewage, Unknown	Pathogens, Siltation
Upper Shannon Branch	Unknown	Pathogens
Puncheoncamp Branch/ Browns Creek	Unknown	Unknown
Buzzard Branch	Land Disposal, Raw Sewage	Pathogens
North Fork/ Elkhorn Creek	Land Disposal, Sewage	Pathogens
Elkhorn Creek	Resource Extraction,	Metals, Unknown,

Stream with acid mine drainage.

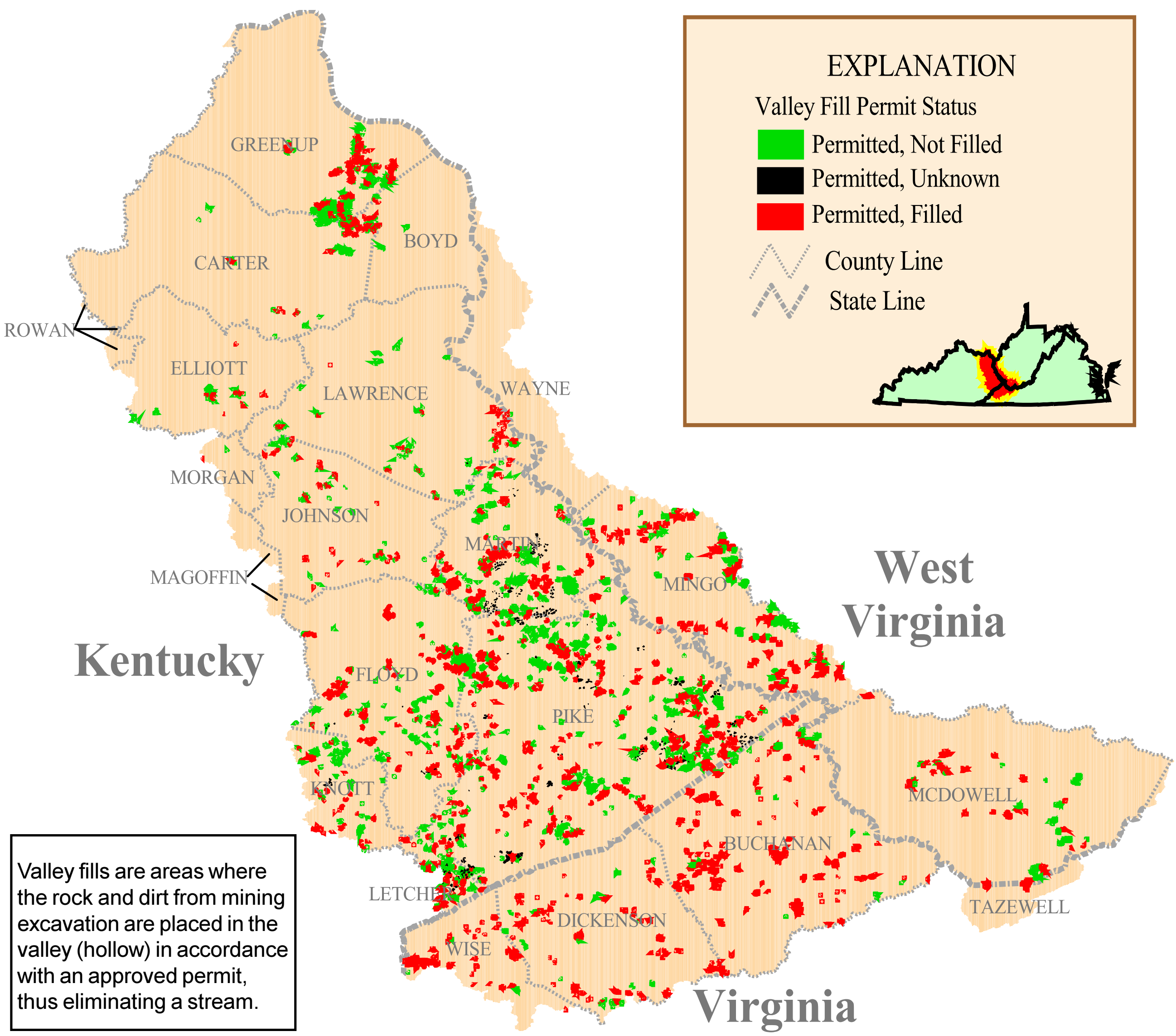
Acid mine drainage is defined as mine-water runoff with high concentrations of acidity, iron, manganese, aluminum and heavy metals, which are toxic to aquatic life.

Acid mine drainage occurs when sulfide-bearing minerals in rock are exposed to air and water, changing the sulfide sulfur to sulfuric acid. This acid dissolves metals found in waste rock and tailings, such as lead, zinc, copper, arsenic, selenium, mercury, and cadmium, into ground and surface water. Many of these metals are toxic to all life and are retained within the food chain.

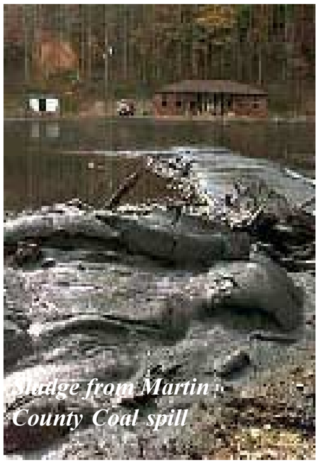
Mining Pollutants

Excess *manganese* in water imparts an off-taste. When oxidized or exposed to the air, manganese forms black coatings that may stain clothing and eating utensils.

The effects of excessive *iron* include bad tasting water, corrosion of metals and reddish staining on clothes and eating utensils.



Valley fills are areas where the rock and dirt from mining excavation are placed in the valley (hollow) in accordance with an approved permit, thus eliminating a stream.

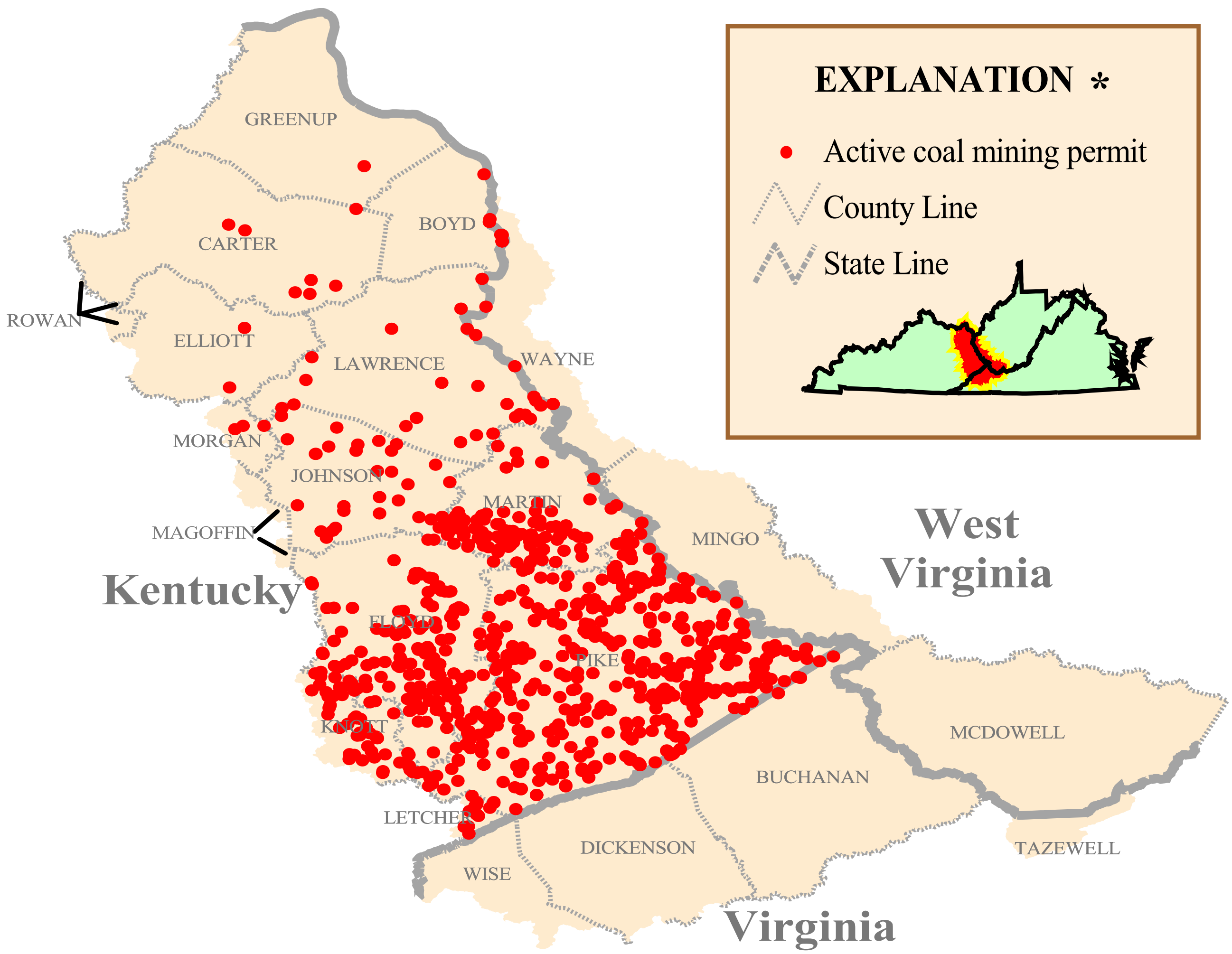


Sludge from Martin County Coal spill

Physical alteration of streams is the altering of the stream bed, usually caused by increased deposits of sediments and the removal of earth. Two categories of stream alteration are channel alteration and subsidence.

Channel alteration is caused by increased runoff associated with mining. The channel alteration and ecological damage occurs in streams due to increasing flows that cause channel adjustments, including increased width and depth. The shape of impacted streams changes in response to increased flow and sediment loads. Stream channels are widened and streambeds are scoured by the erosive forces of high velocity water and transported sediments. Coal mining can have a tremendous effect on channel morphology, depending upon the extraction method.

Subsidence is the sinking of a large area of the earth's crust resulting from past mining activity. Mines long-abandoned may experience subsidence problems. In addition to subsidence, abandoned underground mines are a safety concern. When openings (drift, slope, hoisting shaft, and air shaft) are not sealed upon abandonment, these openings become attractive nuisances. Some people, and hapless animals, may wander through these openings to explore inside the mine and the results can be deadly. The atmosphere in an abandoned underground mine may be unfit or poisonous to breathe and the condition of the roof rock may be so deteriorated that collapse can occur without warning. This phenomenon has resulted in significantly diminished ground water flow and quality in some areas. The reduced water flow leaves wells dry or contaminated with iron or other minerals and forces residents to haul water from offsite.



*Permit data only provided for Kentucky

Endangered River

On October 11, 2000, a mineshaft beneath a coal slurry impoundment owned by Martin County Coal Company collapsed, releasing millions of gallons of coal slurry into the Tug Fork of the Big Sandy River, which flows into the Ohio River. The slurry suffocated the aquatic life in the waterways and threatened public water supplies. Governor Patton declared a disaster area over a ten-county area.

Sludge in creek from Martin County Coal spill.

The Environmental Protection Agency called this one of the worst environmental disasters to ever occur in the southeastern United States.

This catastrophic event illustrates the need for watershed management in several ways. From a water quality standpoint, the slurry smothered aquatic life and made drinking water supplies unsuitable for treatment for many days. From a water quantity standpoint, there was flash flooding of property all up and down the valley; and considering treatability concerns, there were inadequate quantities of water for treatment. From a biodiversity standpoint, all aquatic life and riparian habitat for many miles of stream was totally eliminated in Coldwater Fork and Wolfe Creek watersheds and impacted the Tug Fork and Big Sandy. Events such as this affect human health and safety, water quality and quanity and biodiversity.

Threatened and Endangered Species

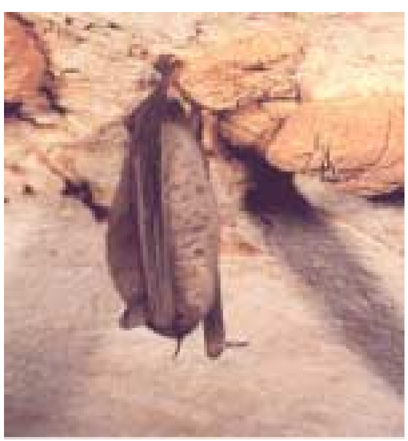
Both the Big Sandy Basin and all of Kentucky have a high level of biodiversity. This is one of the reasons that Kentucky ranks twelfth in the nation in the number of federally listed threatened and endangered species. Pollution, habitat destruction, and competition from exotic species all are taking a toll on the survival of the 42 federally listed species in the state. In addition, of Kentucky's 3,125 native species, 45 are now extinct, and 572 are now considered rare or endangered by the Kentucky State Nature Preserves Commission. Gone from the Big Sandy River Basin are the red and gray wolf, eastern cougar, and ivory-billed woodpecker.

Ivory Billed Woodpecker

Within the Big Sandy Basin can be found four of Kentucky's 42 federally listed threatened or endangered species. The state lists 78 species as threatened or in danger of disappearing from Kentucky that occur within the watershed. Sedimentation, habitat destruction, and water pollution are putting pressure on the survival of the northern brook lamprey, the lake sturgeon, longnose dace, and longhead darter, among other species. Along the banks of the basin streams, the great egret, the black-crowned night heron, and the little blue heron are all fighting for existence. In the skies above the basin, Indiana bats, goldenwinged Warblers, and vesper sparrows are rarely seen.

As all species are interdependent, the number of threatened and endangered species is an indicator of the overall health of the Big Sandy basin's waters, and forests. Much greater efforts are necessary to identify, protect, and recover habitat for plants, and animals that are threatened with extinction or disappearing from Kentucky.

Fan Shell



Indiana Bat

Big-eared Bat

Basin Status Summary

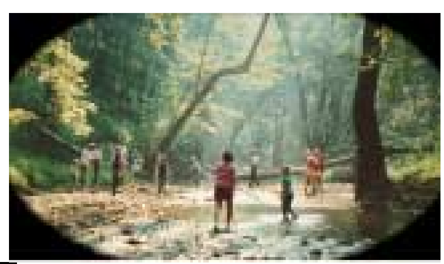
The Big and Little Sandy River Basin is stressed and threatened in many areas. The factors that are stressing the basin are mining, timber operations, and lack of adequate sewage disposal. Mining continues to affect the water quality in the region. Due to mechanization, fewer employment opportunities will be available, although the tonnage of coal mined will increase. The boom and bust cycle in the coal-producing areas will continue. Timber operations are now at all-time record highs for board feet produced and are not sustainable. Timber is also headed for the boom bust cycle unless the resource is managed for long-term production, resulting in positive economic results. This leads to the question, what does this have to do with water quality and the impact within the basin? Timbering and mining severely influence erosion, which chokes off stream life and is the most costly part of treating water for human consumption. Flooding and its damage to property and lives increases dramatically as more areas are mined and timbered. Rain runs off the land instead of being absorbed, as it would on undisturbed land.

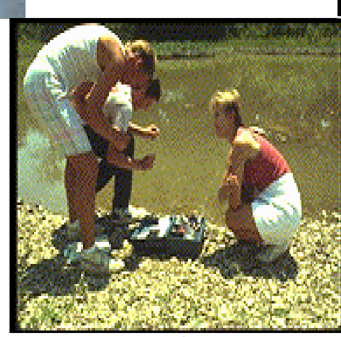
Sewage disposal must be addressed; inadequate sewage disposal is the most common water problem facing the river basin. Straight pipes from individual homes represent the single largest cause of stream impairment. Fecal bacteria counts in many streams are in excess of 300 times allowable limits for human contact, posing threats to human health.

Changes are complex and will take time, money, and, most of all, a willingness of the population to become involved in environmental stewardship. Without the support of the watershed residents, any progress with be difficult to attain. Progress can be attained with everyone working together.

Watershed Watch

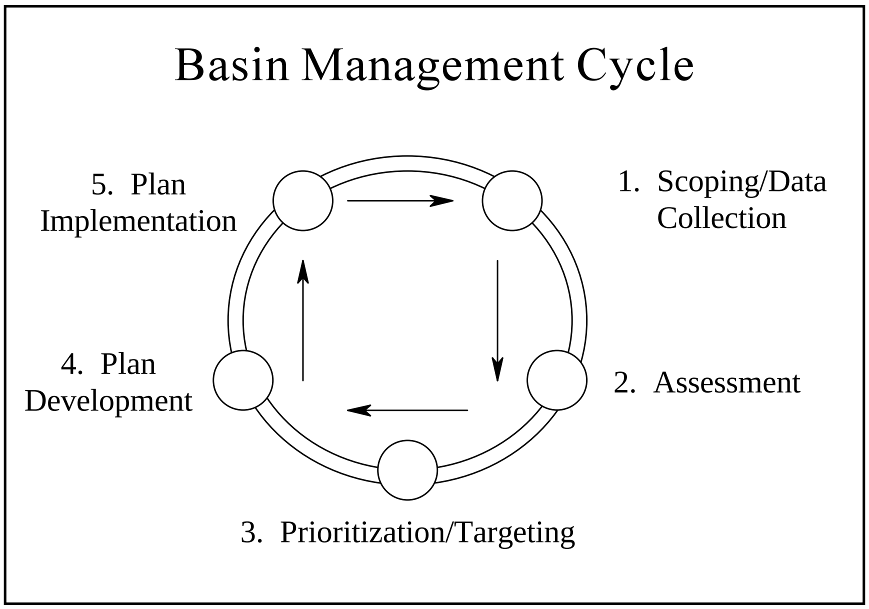
The Kentucky Watershed Watch program brings together interested citizens to monitor the health of the watershed. This citizen-led effort is organized to get people down to the stream and raise awareness of watershed issues. The Big Sandy Watershed Watch was established in 1999 and continues today with assistance from PRIDE, the Virginia Environmental Endowment, Kentucky Waterways Alliance, Kentucky Division of Water, and Prestonsburg Community College, along with assistance from local, state, and federal government agencies. The Big Sandy Watershed Watch has expanded by partnering with the Big Sandy River Basin Coalition, bringing together volunteers and government agencies from all three states within the watershed. The program is always seeking new volunteers, and there is no cost to participate. Learn more by visiting the web site at http://kywater.org/watch/bsr.htm





Kentucky Watershed Management Framework

This report has been produced as part of Kentucky's Watershed Management Framework, which is a new approach to improving the health of the state's watersheds. 2001 was the first year of a five-year planning and management cycle for the Big and Little Sandy river basins. During the second year, several agencies and organizations will conduct extensive monitoring in the region. During the third year, people throughout the region will confer to decide which small watersheds should receive intensified attention during years four and five of the cycle. In year four, improvement plans will be made for the small watersheds selected, and in year five, many agencies and organizations will implement those plans. The cycle then begins again in 2006, with a new evaluation and a new status report. Contributors to this document include members of Big and Little Sandy River Basin Team under the Watershed Framework.



Get connected - Web links

There is a lot of information on the Internet about the Big and Little Sandy Rivers, watershed health, and related matters. Check out these sites to learn more about the science and practice of watershed management in Kentucky and the nation.

- Statewide context for Kentucky's watershed initiative and other watershed links - http://kywatersheds.org
- Ky Division of Water, Water Watch volunteer monitoring - http://water.nr.state.ky.us/ww/
- Kentucky Division of Water - http://water.nr.state.ky.us/dow/
- Kentucky Division of Forestry - http://www.kyenvironment.org/nrepc/dnr/forestry/dnrdof.htm
- Kentucky Division of Conservation (agric. and water) - http://www.kyenvironment.org/nrepc/dnr/conserve/doc2.htm
- Kentucky list of priority impaired ("TMDL") streams - http://water.nr.state.ky.us/303d/
- Kentucky district of the US Geological Survey - http://130.11.24.1
- Conservation Technology – good source for agricultural practice recommendations - http://ctic.purdue.edu/
- Stream corridor restoration guide - http://www.usda/gov/stream_restoration/newtofc.html

Phone numbers for assistance

Ohio River Valley Water Sanitation Commission (volunteer monitoring) and Ohio River Sweep (Ohio River Valley Sanitation Commission (cleanups): (800) 359 - 3977

Water Watch (water body adoption and river cleanups): (502) 564 – 3410

Illegal dumping (Kentucky Division of Waste Management): (502) 564 – 6716

Dead animal removal reports (Ky Dept. of Agriculture): (502) 564 - 3956

Kentucky Waterways Alliance (river protection groups): (502) 524 – 1774

Forest Conservation Act (Kentucky Division of Forestry): (502) 564 - 4496

Kentucky Agricultural Water Quality Act: (502) 564 – 3080

Kentucky Department of Fish and Wildlife Resources: (502) 564 – 5448

Also to find your local:

District Health Department (cleanup days, septic problems and illegal dumping): (502) 564-4856

Conservation District office (agricultural practices) (502) 564-3080

RC & D Office (agricultural practices) (606) 224-7403

County Solid Waste Coordinator (illegal dumping) (502) 564-6716

Land activities that can impact water quality

Activity	Impacts
Row cropping	Siltation, erosion, chemical and fertilizer runoff.
Livestock production	Manure runoff (excessive nutrients and bacteria), damage to streamside vegetation, bank erosion.
Logging	Loss of streamside trees, bank erosion, siltation from roads, increased runoff.
Mining	Acidity and sulfates from iron sulfide rocks, sediment, runoff surges.
Oil and gas drilling	Brine from drilling, sediments, oily runoff.
Residential yards	Lawn and garden chemical and fertilizer runoff, higher runoff velocities.
Urban development	Siltation from land clearing, runoff surges (oils and metals) from roofs, roads, parking lots.
Industrial facilities	Chemical runoff from material storage areas, soot deposits, runoff surges, spills.
Commercial development	Runoff surges (oils and metals) from parking lots, roofs; sediment from land clearing.
Stream clearing	Sedimentation, loss of wildlife/mussel habitat, loss of shading (increased temp.), flooding.
Channelization	Increased flooding, sedimentation, loss of fish/insect habitat, loss of mussel beds.
Construction in floodplains	Increased flooding, siltation, danger to life and property.
Boating	Metals, oils, and pathogens from discharge of sanitary waste.
All terrain vehicles (ATVs)	Erosion, loss of habitat.

Practices that reduce impacts from land activities

Activity	Management practices
Row cropping	Use conservation tillage, targeted chemical use, strip cropping, and streamside buffers.
Livestock production	Move facilities uphill, install waste treatment systems, stream fencing, and setbacks.
Logging	Skid on the contour, avoid streams, preserve streamside trees, and install water bars.
Mining	Reclaim mined areas, mix acid and alkaline material, add erosion/sediment controls.
Oil and gas drilling	Store or treat wastes from drilling, control sediments and oils.
Residential yards	Reduce/eliminate lawn/garden chemical use, preserve streamside vegetation.
Urban development	Sediment/erosion/stormwater controls, minimize land clearing and pavement, preserve existing trees.
Industrial facilities	Cover stored materials, control/treat runoff, minimize air/water discharges.
Commercial development	Minimize land clearing, control/treat runoff, reduce parking lots/road sizes.
Stream clearing	Minimize clearing, preserve vegetation, promote greenways/buffers.
Channelization	Decrease flooding by reducing or slowing runoff, restore streamside wetlands.
Construction in floodplains	Limit or eliminate development in floodplains.
Boating	Use marine sanitation devices and pumpout facilities.
ATVs	Use ATVs only in designated areas and maintained trails.

Big and Little Sandy Basin Team Men

Neil Parson	Big Sandy Area Development District
Doug Doerfeld	Citizen Environmentalist
Jean Dorton	PRIDE
Paul Thompson	Prestonsburg Community College
Tom Vierheller	Kentucky Waterways Alliance/Prestonsburg Community College
Clark Allison	Big Sandy Resource Conservation & Development District
Dave Gardner	Big Sandy Area Development District
Al Surmont	Kentucky Department of Fish and Wildlife

Big Sandy Area Development District

Kentucky Waterways Alliance

More web sites

- North Carolina water quality research center – especially for agriculture - http://www.bae.ncsu.edu/bae/programs/extension/wqg/
- Photos of recommended resource management practices - http://earthl.epa.gov/owow/nps/ex-bmps.html
- Volunteer monitoring information - http://www.epa.gov/owow/monitoring/vol.html
- Nonpoint source information for local officials - http://www.lib.uconn.edu/canr/ces/nemo/nsmodule/nsdetail.html
- Center for Watershed Protection - http://www.pipeline.com/~mrrunoff/
- US EPA nonpoint source pollution - http://www.epa.gov/owow/nps/
- US EPA wetlands information - http://www.epa.gov/owow/wetlands/
- EPA's Watershed Information Network for data, help, and lots of other useful watershed information - http://www.epa.gov/win/
- Information about small-quantity wastewater treatment options - http://www.estd.wvu.edu/nsfc/
- American Rivers, a river protection organization - http://www.amrivers.org/
- River Network, a river protection organization - http://www.rivernetwork.org/

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On request, this material can be made available in alternate formats for individuals with disabilities. To request alternate formats or additional copies, contact Ted Withrow at (606) 784-6634 or Lee Colten, Kentucky Division of Water, 14 Reilly Road, Frankfort, KY 40601, or call (502) 564-3410.

Kentucky Watershed Framework Status Report of the Big and Little Sandy Watersheds

For more information or additional copies visit the Kentucky Watershed Management Home page at kywatersheds.org or call (502) 564-3410

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